

Recent observations of Arctic INP and their variation over the past 500 years

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Measurements of ice nucleating particle (INP) concentrations in the Arctic are scarce, and historical records did not exist until now. Here, present-day observations onboard the RV Polarstern (PASCAL cruise from May to July 2017 in the area around Svalbard up to 83.7°N) and ice core-derived concentrations for the past 500 years are presented.

During PASCAL, the INP concentrations were measured online with the Spectrometer for Ice Nuclei (SPIN; DMT), and determined from filter samples by application of freezing array techniques. By combining these methods, the whole temperature regime relevant for mixed phase clouds is covered. The ice cores originate from Summit (Greenland) and Lomonosovfonna (Svalbard), and cover a time range from 1457 to 1989 AD and 1480 to 2001 AD, respectively. The ice core samples were analyzed by the freezing array techniques only.

The contribution of local sources to present-day INP is assessed by comparing the INP populations (a) from different sources such as the sea surface micro layer, deeper sea water, snow and fog, (b) the correlation to meteorological parameters, and (c) the use of back trajectory modelling. The sensitivity of the historical INP concentrations to other ice core-derived parameters is investigated to identify potential INP sources.

These datasets can be used in climate models to study the role of INP in the observed Arctic Amplification.

The works were carried out in the framework of the DFG-funded TR 172 (Arctic Amplification).

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